

Ariel Bowman, MD; Paul Jhun, MD; Amal Mattu, MD; Jan Shoenberger, MD; William J. Brady, MD;
Jeffrey A. Tabas, MD



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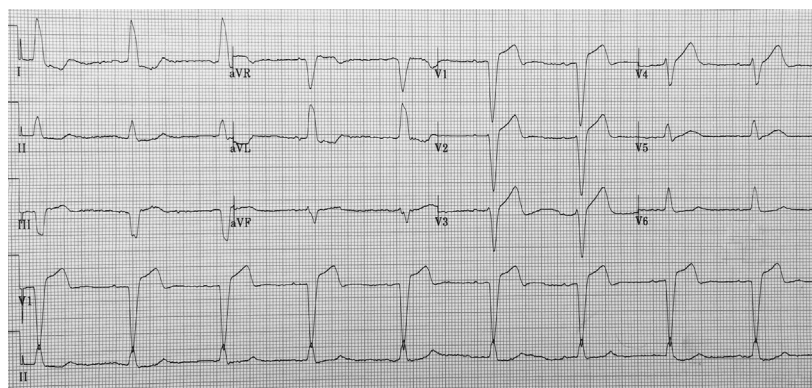


Figure 1. Initial emergency department ECG.

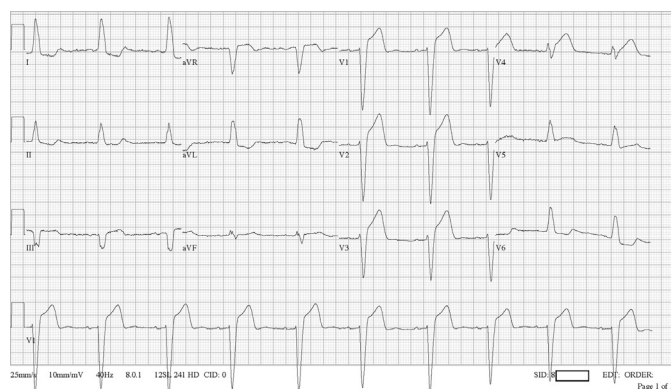


Figure 2. Repeat ECG 20 minutes after first.

[Ann Emerg Med. 2018;71:117-119.]

A 76-year-old woman presented to the emergency department with acute chest pain for 20 minutes. The chest pain radiated to the neck, jaw, and teeth, and was associated with nausea, dyspnea, and diaphoresis. The patient was hemodynamically stable and appeared only slightly uncomfortable. The cardiac and pulmonary examination results were normal, and the remainder of the examination was unremarkable. The ECG on arrival is shown in Figure 1. No previous ECGs were available.

The patient received a cardiac monitor and was treated with aspirin and nitroglycerin, which did not improve her pain. Laboratory studies were conducted, including cardiac biomarkers. By 20 minutes after arrival, she reported that her symptoms were worsening. A second ECG was obtained (Figure 2).

Should the cardiac catheterization laboratory be activated according to findings in either of these ECGs?

*For the diagnosis and teaching points, see page 118.
To view the entire collection of ECG of the Month, visit www.annemergmed.com*

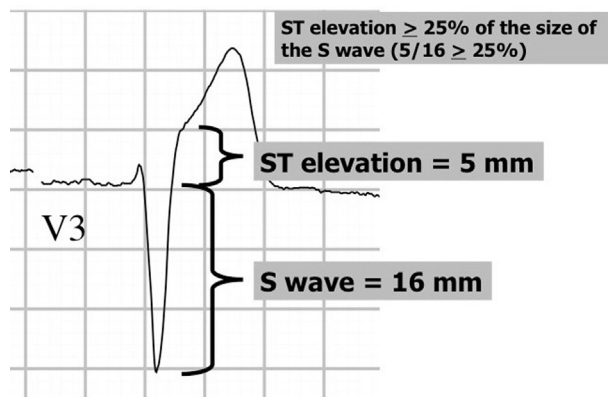


Figure 3. Blow up of lead V3 from the second ECG. There is 5 mm of ST-segment elevation. The S wave is 16-mm deep. The ratio (5:16) is greater than 0.25, which is highly suggestive of acute coronary obstruction when present in any single lead in the setting of left bundle branch block.

ECG OF THE MONTH

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DIAGNOSIS:

Interpretation

The ECG in Figure 1 demonstrates sinus rhythm with an uncomplicated left bundle branch block pattern. There is ST-segment elevation in leads V1 to V3, which is appropriately discordant with the S waves in those leads.

The ECG in Figure 2 demonstrates evolution of the ST-segment elevation in leads V2 and V3. The ST-segment elevation was now more than 25% of the size of the S wave, which is excessively discordant. This meets criteria as an ST-segment elevation myocardial infarction equivalent according to recently published data.^{1,2}

CLINICAL COURSE

Given the high clinical suspicion for acute coronary occlusion according to the repeated ECG, the providers activated the cardiac catheterization laboratory. During cardiac catheterization, the mid left anterior descending artery was found to be 100% occluded. Aspiration thrombectomy was performed and a single drug-eluting stent was placed to the mid left anterior descending artery. The initial troponin T result was 0.03 ng/mL (normal <0.01 ng/mL). A subsequent troponin test result 1 day postcatheterization was 1.42 ng/mL.

DISCUSSION

Left bundle-branch block causes repolarization changes resulting in ST-segment deviation that is discordant with (opposite to) the main direction of the QRS. These repolarization changes were thought to obscure the diagnosis of acute myocardial infarction until the development and validation of specific ST-segment criteria in 1996 by Sgarbossa et al.³ In accordance with these findings, 1 mm of ST-segment deviation concordant with the main direction of the QRS was found to be highly specific for acute coronary occlusion. Discordant ST-segment deviation of more than 5 mm was initially included but found not to provide additional predictive value.⁴ Smith et al¹ subsequently derived and validated a modification that they termed *excessively discordant ST-segment deviation*. Excessive discordance is diagnosed if the amount of ST-segment elevation compared with the depth of the S wave is equal to or greater than 25% in any of the V1 to V3 leads. In a validation study of 258 patients, the modified criteria were 80% sensitive and 99% specific for identification of acute coronary occlusion in the presence of left

bundle branch block compared with 49% sensitivity and 100% specificity for the original criteria. Positive and negative likelihood ratios for the modified criteria were 99.6 (95% confidence interval 24.9 to 399.1) and 0.20 (95% confidence interval 0.11 to 0.36), respectively.² Cai et al⁵ proposed use of this modified Sgarbossa criterion for the management algorithm of suspected acute myocardial infarction in left bundle branch block and recommended initiation of primary percutaneous coronary intervention or fibrinolytic therapy when it is present.

Figure 3 demonstrates the presence of the modified criterion in lead V3 of the repeated ECG. The magnitude of the ST-segment elevation (5 mm) is more than 25% of the size of the S wave (16 mm). In accordance with this finding, the cardiac catheterization laboratory was activated and a 100% coronary occlusion was confirmed and treated.

In summary, this ECG series demonstrates the clinical utility of the modified Sgarbossa criterion. Acute coronary occlusion can be diagnosed in patients with left bundle branch block if providers have a sound knowledge of the 2 original criteria and the newly modified third criterion.

Author affiliations: From the Department of Emergency Medicine, Los Angeles County Medical Center, Los Angeles, CA (Bowman); the Department of Emergency Medicine, University of California–San Francisco School of Medicine, San Francisco, CA (Jhun, Tabas); the Department of Emergency Medicine, University of Maryland School of Medicine, Baltimore, MD (Mattu); the Department of Emergency Medicine, University of Southern California School of Medicine, Los Angeles, CA (Shoenberger); and the Department of Emergency Medicine, University of Virginia School of Medicine, Charlottesville, VA (Brady).

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